What is Claimed is:

1. A circuit for controlling output current from a ballast to a lamp comprising:

a) a temperature sensing circuit thermally coupled to the ballast to provide a temperature signal having a magnitude indicative of ballast temperature, Tb; and,

b) control circuitry capable of causing the ballast to enter a current limiting mode when the magnitude of the temperature signal indicates that Tb has exceeded a predetermined maximum desired ballast temperature, T1;

wherein the control circuitry reduces the output current in response to the temperature signal according to one of (i) a step function or (ii) a combination of step and continuous functions, while continuing to operate the ballast.

2. The circuit of claim 1, wherein the continuous function is a linear function.

3. The circuit of claim 1 wherein the control circuitry, when operating the ballast in the current limiting mode, is responsive to a determination that Tb is equal to or less than a threshold temperature T2 to increase the output current, wherein T2 is less than T1, such that the output current profile exhibits hysteresis in the current limited mode.

4. The circuit of claim 3 comprising circuitry that provides a first threshold signal having a magnitude indicative of T1, and at least another, second, threshold signal having a magnitude indicative of T2.

5. The circuit of claim 3 wherein the control circuitry increases the output current in a step function.

6. The circuit of claim 3 wherein the control circuitry both reduces and increases the output current in step functions.

7. The circuit of claim 1 wherein the current limiting mode has a first state that reduces the output current in a linear function and a second state, following the first state, that further reduces the output current in a step function.

8. The circuit of claim 7 wherein, the control circuitry causes the ballast to enter the first state of current limiting mode when the magnitude of the temperature signal indicates that Tb has exceeded T1 and to enter the second state when the magnitude of the temperature signal indicates that Tb has exceeded a temperature T2, that is greater than T1.

9. The circuit of claim 8 wherein, the control circuitry, when operating the ballast in the second state of the current limiting mode, is responsive to a determination that Tb has decreased to a temperature T3, that is between T1 and T2, to increase the output current in a step function.

10. The circuit of claim 1 wherein the current limiting mode has a first state that reduces the output current in successive step functions.

11. The circuit of claim 10 comprising circuitry that provides a first threshold signal indicative of the magnitude of T1 and a second threshold signal indicative of the magnitude of a temperature T2 that is greater than T1, wherein the control circuitry, when operating the ballast in the first state of the current limiting mode, is responsive to a determination that Tb has reached T1 to decrease the output current in a first step function, and to a determination that Tb has reached T2 to further decrease the output current in a second step function.

12. The circuit of claim 11 wherein the circuitry provides a third threshold signal indicative of the magnitude of a temperature T3 that is less than T1 and a fourth threshold signal indicative of the magnitude of a temperature T4 that is between T2 and T1, and wherein the control circuitry, when operating the ballast in the first state of the current limiting mode, is responsive to a determination that Tb has decreased to T4 to increase the output current in a third step function, and to a determination that Tb has further decreased to T3 to further increase the output current in a fourth step function.

13. The circuit of claim 10 wherein the current limiting mode has a second state, following a last one of the step functions, that further reduces the output current in a linear function.

14. The circuit of claim 1 further comprising a temperature cutoff circuit for shutting down the ballast if Tb reaches or exceeds an unsafe maximum temperature that is greater than T1.

15. The circuit of claim 1 wherein the control circuitry generates at least one switching signal for driving at least one output switch of the ballast, and is responsive to a difference between Tb and T1 to alter one of duty cycle, pulse width or frequency of the at least one switching signal.

16. The circuit of claim 14 wherein the ballast is a dimming ballast responsive to a phase controlled AC dimming signal produced by a dimming control, and the control circuitry comprises:

a phase to DC converter that converts the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal, and

a drive circuit that generates at least one switching signal for driving at least one output switch of the ballast; and

wherein the drive circuit is responsive to the DC signal and to a feedback signal indicative of the output current to alter the at least one switching signal.

17. The circuit of claim 15 wherein the control circuitry further comprises a clamp circuit that prevents the magnitude of the DC signal from exceeding a pre-selected upper level, and wherein the pre-selected upper level is adjusted in accordance with the difference between Tb and T1.

18. The circuit of claim 14 wherein the ballast is a dimming ballast responsive to a phase controlled AC dimming signal produced by a dimming control, and the control circuitry comprises:

a phase to DC converter that converts the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal,

a multiplier circuit providing an output in accordance with the DC signal and a scaled difference between Tb and T1, and

a drive circuit that generates at least one switching signal for driving at least one output switch of the ballast; and

wherein the drive circuit is responsive to the output of the multiplier and to a feedback signal indicative of the output current, to alter the at least one switching signal.

19. The circuit of claim 1 wherein reductions and increases in output current cause reductions and increases in illumination provided by the lamp, and wherein the reductions are abrupt and perceptible to a human.

20. A ballast comprising:

a) an output circuit that provides output current to a load and having switching circuitry;

b) a reference generator providing reference information concerning a first threshold temperature, T1, for the ballast;

c) a temperature sensitive device to provide ballast operating temperature information, Tb;

d) comparison circuitry that provides a first signal having a magnitude indicative of a difference by which Tb exceeds T1; and,

e) control circuitry providing a drive signal to the switching circuitry, the control circuitry responsive to the signal provided by the comparison circuitry to adjust at least one of duty cycle, pulse width or frequency of the drive signal so as to alter the output current provided by the ballast according to one of (i) a step function or (ii) a combination of step and continuous functions, while continuing to operate the ballast, when the comparison circuitry indicates that Tb is greater than
T1 .

21. The ballast of claim 20 wherein the reference generator provides information concerning a second threshold temperature T2, less than T1, for the ballast, and wherein the comparison circuitry provides a second signal having a magnitude indicative of a difference by which Tb exceeds T2, and wherein the control circuitry is responsive to the first signal from the comparison circuitry to reduce the output current to a first current level in a step function at T1, and is responsive to the second signal from the comparison circuitry to increase the output current in a step function to a second current level greater than the first current level at T2.

22. The ballast of claim 20 wherein the control circuitry is responsive to the signal from the comparison circuitry to reduce the output current linearly between T1 and a second

threshold temperature T2 greater than T1, and to reduce the output current in a step function at T2.

23. The ballast of claim 22 wherein the control circuitry increases the output current in a step function at a third threshold temperature T3 that is between the threshold temperatures T1 and T2.

24. The ballast of claim 20 wherein the load is a lamp and alterations in output current cause alterations in illumination provided by the lamp, and wherein the alterations are abrupt and perceptible to a human.

25. The ballast of claim 20 further comprising a temperature cutoff circuit for shutting down the ballast if Tb reaches or exceeds an unsafe maximum temperature that is greater than T1.

26. The ballast of claim 20 wherein the ballast is a dimming ballast responsive to a phase controlled AC dimming signal produced by a dimming control, and the control circuitry comprises:

a phase to DC converter that converts the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal, and

a drive circuit that generates at least one switching signal for driving at least one output switch of the ballast; and

wherein the drive circuit is responsive to the DC signal and to a feedback signal indicative of the output current to adjust the at least one switching signal to the switching circuitry.

27. The ballast of claim 26 wherein the control circuitry further comprises a clamp circuit that prevents the magnitude of the DC signal from exceeding a pre-selected upper level, and wherein the pre-selected upper level is adjusted in accordance with the difference by which Tb exceeds T1.

28. The circuit of claim 20 wherein the ballast is a dimming ballast responsive to a phase controlled AC dimming signal produced by a dimming control, and the control circuitry comprises:

a phase to DC converter that converts the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal,

a multiplier circuit providing an output in accordance with the DC signal and a scaled difference between Tb and T1, and

a drive circuit that generates at least one switching signal for driving at least one output switch of the ballast; and

wherein the drive circuit is responsive to the output of the multiplier, and to a feedback signal indicative of output current, to adjust the at least one switching signal to the switching circuitry.

29. A thermally protected ballast comprising:

(a) a front end AC-to-DC converter for receiving a supply voltage;

(b) a back end DC-to-AC converter coupled to the front end AC-to DC converter for providing output current to a load;

(c) a temperature sensitive device adapted to provide a signal indicative of a temperature of the ballast, Tb;

(d) a current limiting circuit providing an output responsive to Tb; and

(e) a control circuit responsive to the output of the current limiting circuit, and driving the back end DC-to-AC converter in accordance with the output of the current limiting circuit;

wherein the current limiting circuit causes the control circuit to adjust the output current in response to a detected over-temperature condition, according to one of (i) a step function or (ii) a combination of step and linear functions, while continuing to operate the control circuit.

30. The ballast of claim 29 further comprising a temperature cutoff circuit for shutting down the ballast if the temperature of the ballast reaches or exceeds an unsafe maximum temperature.

31. The ballast of claim 29 wherein the control circuit reduces the output current linearly when Tb is between a first threshold temperature T1 and a second threshold temperature T2 that is greater than T1, and reduces the output current in a step function when Tb is equal to or greater than T2.

32. The ballast of claim 31 wherein, after Tb reaches T2, the control circuit increases the output current in a step function at a third threshold temperature T3 that is between T1 and T2.

33. A method of controlling a ballast comprising the steps of:

a) measuring ballast temperature, Tb;

b) comparing Tb to a first reference, T1;

c) providing an indication of difference between Tb and T1; and

d) controlling output current provided by the ballast according to one of (i) a step function or (ii) a combination of step and continuous functions, while continuing to operate the ballast, in accordance with the result of step (c).

34. The method of claim 33 wherein step (d) comprises altering one of duty cycle, pulse width or frequency of at least one switching signal provided to at least one switch in an output circuit of the ballast in accordance with the difference.

35. The method of claim 33 further comprising shutting down the ballast if the ballast temperature reaches or exceeds an unsafe maximum temperature.

36. The method of claim 33 wherein step (d) comprises reducing the output current linearly when Tb is between T1 and a second reference T2, where T2 is greater than T1, and reducing the output current in a step function when Tb is equal to or greater than T2.

37. The method of claim 36 wherein step (d) further comprises increasing the output current, after Tb reaches T2, in a step function at a third reference T3 that is between T1 and T2.

38. The method of claim 33 wherein step (d) comprises reducing the output current in successive step functions.

39. The method of claim 38 wherein step (b) further comprises comparing Tb to a second reference T2, greater than T1; step (c) further comprises providing an indication of the difference between Tb and T2; and step (d) comprises reducing the output current in a step

function when Tb is between T1 and T2, and further reducing the output current in a step function when Tb is equal to or greater than T2.

40 The method of claim 39 further comprising the steps of:

(e) after Tb has equaled or exceeded T1, but before Tb has equaled or exceeded T2, comparing Tb to a third threshold T3, less than T1;

(f) providing an indication of the difference between Tb and T3;

(g) increasing the output current in a third step function responsive to the indication of step (f);

(h) after Tb has equaled or exceeded T2, comparing Tb to a third threshold T4, between T1 and T2;

(i) providing an indication of the difference between Tb and T4; and

(j) increasing the output current in a fourth step function responsive to the indication of step (i).

41. The method of claim 33 wherein the ballast is responsive to a phase controlled AC dimming signal produced by a dimming control and the output current is controlled by at least one output switch; and wherein step (d) further comprises

converting the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal; and

controlling the at least one output switch in response to the DC signal and to a feedback signal indicative of the output current.

42. The method of claim 41 wherein step (d) further comprises clamping the magnitude of the DC signal from exceeding a pre-selected upper level, and wherein the pre-selected upper level is adjusted in accordance with the difference between Tb and T1.

43. The method of claim 33 wherein the ballast is responsive to a phase controlled AC dimming signal produced by a dimming control and the output current is controlled by at least one output switch; and wherein step (d) comprises the steps of

(1) scaling the indication of the difference between Tb and T1;

(2) converting the dimming signal to a DC signal having a magnitude that varies in accordance with a duty cycle value of the dimming signal;

(3) multiplying the DC signal and the scaled indication of the difference between Tb and T1 from step (1); and

(4) controlling the at least one output switch in response to the result of step (3) and to a feedback signal indicative of the output current.

44. The method of claim 33 wherein controlling the output current causes reductions and increases in the illumination provided by a lamp connected to the ballast, and wherein the reductions are abrupt and perceptible to a human.

45. A ballast comprising:

(a) a ballast temperature sensor providing a ballast temperature signal indicative of a ballast temperature;

(b) a foldback protection circuit receiving the ballast temperature signal and providing a foldback protection signal responsive to the ballast temperature signal;

(c) a ballast drive circuit receiving the drive signal and providing at least one switching control signal; and

(d) a DC/AC back end receiving the at least one switching control signal and providing an output current to drive a lamp;

wherein the output current is responsive to the ballast temperature signal according to one of (i) a step function or (ii) a combination of step and continuous functions.

46. The ballast of claim 45 further comprising:

(e) a high end clamp receiving the foldback protection signal and providing a DC control signal to the ballast drive circuit.

47. The ballast according to claim 45 further comprising:

(e) a high end clamp providing a maximum current limiting signal indicative of a maximum current to be supplied by the ballast to the lamp; and

(f) a multiplier receiving the foldback protection signal and the maximum current limiting signal and providing a DC control signal to the ballast drive circuit.